L'ÉVACUATION D'UN BLOC OPÉRATOIRE EST UN PROCESSUS COMPLEXE : QUI FAIT QUOI?

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Les normes de l'AIISOC relatives à cet article figurent dans la publication Normes, lignes directrices et énoncés de positions pour la pratique de soins infirmiers périopératoires autorisés (9e édition) de l'Association des infirmiers et infirmières de salle d'opération du Canada (AIISOC) de juin 2009, section 4, p.331 à 333, Normes 1.4 – 1.4.9.

RÉSUMÉ :

En 2007, à la suite du déménagement de tout le département du bloc opératoire pour adultes du Winnipeg Health Sciences Centre et pour se conformer aux exigences du code de prévention des incendies, il a été nécessaire de réévaluer et de modifier le plan d'évacuation en place, de simuler et de tester ces modifications au sein du nouvel environnement.

La planification d'une simulation d'évacuation en cas d'incendie d'un important bloc opératoire tertiaire est un processus très complexe qui nécessite beaucoup de planification et de souci du détail. Une approche multidisciplinaire est à préconiser étant donné que de nombreux départements sont concernés. Les leçons tirées de l'expérience d'un site pourraient bénéficier à d'autres. L'objectif de cet article est de fournir quelques exemples de planification et des lignes directrices pouvant être utilisés par d'autres sites qui entament ce processus important.

Les photos de cet article ont été incluses pour rehausser la présentation visuelle et il se peut qu'elles ne soient pas conformes aux normes de l'AIISOC.

KEYWORDS: OR FIRE DRILL, EVACUATION PLANNING, EVACUATION SIMULATION.

EVACUATING AN OR IS A COMPLEX PROCESS: WHO DOES WHAT?

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ABSTRACT:

It became necessary, following the relocation of the entire Winnipeg Health Sciences Centre Adult OR department in 2007 and in consideration of fire code regulations, to re-evaluate and modify the existing evacuation plan and to simulate, and test, these modifications in the new environment.

Planning a fire evacuation simulation for a large tertiary OR is a very complex process and involves a great deal of planning and attention to detail. It requires a multidisciplinary approach as it involves many departments. Learning about one site's experiences may benefit others. The goal of this article is to provide some planning examples and guidelines for use by sites that are beginning to undertake this important process.

Photos in this article have been included for visual appeal and may not conform with ORNAC Standards.

INTRODUCTION:

Theatre personnel review their volunteer patient's medical profile.

Most operating room fires begin either on or in the patient.[1] As a result many OR staff do not consider scenarios that would result in the evacuation of an entire OR department. Such a scenario might, however, result if a fire ignited in a theatre's infrastructure, such as in the service arm or a sterilizer located inside a theatre[2,3] when there would be a risk of the fire spreading via built-in components that are linked to other theatres.

Evacuation processes may need to be revised at different points of time as a result of various changes within the OR environment. When the operating room department at the Winnipeg Health Sciences Centre was re-located to a new building it was determined that we needed to re-evaluate the existing evacuation plan and determine if it would still be efficient and effective in the new environment.

The purpose of this article is to share the author's experiences during the planning of a fire evacuation simulation, in a large 13-theatre OR in a tertiary hospital. Evacuation planning quickly became a challenging and complex process. A multidisciplinary planning team, with representatives from all departments involved, was essential in order to develop a smooth, efficient evacuation process.

A primary objective of this simulation was to see if the existing fire evacuation plans worked in a non-threatening situation.

Planning Process:

A date and time were scheduled, several months in advance of the mock evacuation drill, for a fire evacuation simulation to take place during surgical grand rounds and anaesthesia rounds. By incorporating this simulation in to the educational rounds activity, it became more convenient for physicians to participate in the mock evacuation.

The plan involved participation from other departments including the post-anaesthesia care unit (PACU), Fire Safety, Medical Device Reprocessing (MDR), Security, Engineering, Patient Transport, Maintenance, and the Paediatric OR (located in an adjoining building). The first step in planning a mock code green was, as a result, to create an interdisciplinary planning team. This team consisted of anaesthetists; nurses; surgeons; several staff from the OR and post-anaesthesia care unit (PACU) including the director, managers and educators; equipment management personnel; and the site's fire safety officer.

Conducting evacuation simulations, on a regular basis, is a requirement identified by the National Fire Code of Canada, section 2.8.2.[4] A primary objective of this simulation was to see if the existing fire evacuation plans worked in a non-threatening situation. The goal was to search for system inefficiencies, strengthen the existing evacuation plan and optimize the safety of patients and personnel in a code green situation.

The plan included having ten theatres operating, with a variety of surgical procedures underway and at different

Charge nurse and anaesthetist plan theatre destinations

stages in the surgery, in order to best replicate the situation at any given time on a regular elective slate. The daily OR theatre staffing assignment was created ahead of time. Personnel reported for work and, as per usual, went into their assigned theatres at the start of their shift. Inside the theatre they found a written mock case scenario that included health information about a patient, the stage of surgery, monitoring of equipment in use, etc.

The mock fire started in an electrical and gas supply service arm located in one operating theatre. The fire's place of origin resulted in a need for all theatres to be evacuated due to the risk of the fire spreading to the service arms in other theatres via the oxygen and electrical channels. The code red quickly became a code green! The scenario deliberately extreme, in order to push our evacuation plan to the limit, but was also reasonably realistic.

The mock evacuation included some volunteers who acted as surgical patients who were awake at the time of the fire. In other theatres, clinical simulation mannequins were used to represent the patients. These mannequins were accompanied by technicians who were able to change vital signs, etc. The "mannequin patients" provided clinical challenges, to each surgical team, by exhibiting various signs and symptoms during the code. The critical thinking, that was required on the part of the team, enhanced the educational value of the exercise for participants and allowed both the physicians and the nurses to use the evacuation experience toward educational credits. Each volunteer patient was provided with a short, written, medical history. In theatres where the patient was still awake the surgical teams were challenged to manage their anxious patients while maintaining their safety and conducting the evacuation.

The fire began about 10 minutes after the theatres were staffed allowing each team the opportunity to meet their volunteer patient, or learn about the mannequin, and become familiar with their theatre's case scenario.

The Code Red…

The evacuation planners were the only individuals who knew in which theatre the fire was to occur. Dry ice was placed in that theatre, without the team's knowledge, to simulate smoke in the vicinity of the service arm. The hospital engineers and maintenance staff manipulated the fire alarm system for the mock evacuation and enabled the theatre nurse to actually pull the closest fire alarm. The second stage fire alarm was also activated and had been manipulated so that it would only be heard in the OR in order to avoid disturbing neighbouring departments. The noisy environment created by the fire alarm helped make the situation as realistic as possible! Personnel in the fire theatre were also able to actually shut off the medical gas supply lever-valves located on the outside wall of the theatre.

The team in the theatre with the fire evacuated immediately. They were instructed on their evacuation destination as they exited the theatre.

…Quickly Became a Code Green!!!

Because of the risk that the fire would spread to other service arms, via the infrastructure, the decision was made to call a code green evacuation. The challenge then became communicating from the control desk to each theatre. The theatres' intercom broadcast system could not be used because theatre personnel would not hear the message over the sound of the fire alarm. The following communication plan was developed to address this issue:

The critical thinking, that was required on the part of the team, enhanced the educational value of the exercise for participants and allowed both the physicians and the nurses to use the evacuation experience toward educational credits.

- The charge nurse delegated responsibilities to three nurses who each went into four ORs (to cover off the total of 12 participating theatres) with the following written script:
  - o "There is a fire in theatre ____"
  - o "You will need to evacuate shortly, please prepare to do so"
  - o "Do not leave until you are given your destination…we will tell you in a few minutes"
  - o "What stage of surgery are you at?"
  - o "How stable is your patient?"

Each nurse was given a sheet of paper, containing this, script to ensure they communicated all the required information and on which they could also make notes. The information gathered by each nurse was reported to the charge nurse and charge anaesthetist who quickly assigned evacuation destinations. Criteria for determining destinations were based on the patient's situation. Patients who were:

- o Awake, preoperative and stable were returned to their unit of origin;
- o Packed, stable and required ventilation were evacuated to PACU and/or Surgical Intensive Care Unit (SICU) for intensive monitoring; and
- o Ventilated patients and those requiring immediate continuation of surgery were evacuated to the Trauma OR located in the Emergency Department or to other OR departments at the site including the Children's Hospital OR and Women's Hospital OR.

The fire safety officer arrived in the OR following the Code Red call, and determined the safest time limit for the evacuation. The same three nurses were sent back to each of their four theatres and used the following script:

- "Your destination is _____"
- "You should evacuate within approximately _____ minutes"
- "Report back by telephone when you arrive"

Evacuation times for each theatre varied according to each patient's unique situation but, in all cases, each team attempted to meet the time limit that had been identified by the fire safety officer.

Three individuals (clerks and nurses) were appointed by the charge nurse to answer telephone calls at the OR control desk. Part of their role was to document the details of telephone calls from OR teams who had reached their designated evacuation destination, with their patients, and were reporting back. It was important for the charge nurse and anaesthetist to know if those teams had the required resources readily available in order to safely manage their patients. It was also critical that the charge nurse and anaesthetist were able to confirm that all personnel, from all theatres, were safely out of the OR.

General surgery team evacuate with their patient.

In order to ensure that adequate information was obtained from each surgical team, all personnel answering telephones at the OR desk were given fill-in-the-blank evacuation destination report forms. The purpose of the form was to ensure the individual receiving the telephone call obtained essential information including:

- Theatre;
- Patient's name;
- Patient's status;
- Names of personnel present at the evacuation destination; and
- Supplies required.

EVACUATING AN OR cont. on page 30

It is important to establish specific evacuation routes for the perioperative environment.[5] A laminated fire evacuation floor plan, showing evacuation routes, had, for this reason, been posted in each theatre when the OR Department was first moved in to the new building. On the back of this evacuation floor plan were the following directives for the staff:

Before leaving the theatre:
- Turn off and disconnect the anaesthetic machine from the service arm;
- Shut off the medical gas supply lines supplying the theatre;
- Take anaesthesia medications, patient's chart and any supplies/ equipment that you will need;
- Place wet towels along the bottom of the door in the theatre with a fire/smoke;
- DO NOT RETURN to the theatre without checking with fire personnel;
- Telephone the OR control centre and report back when you arrive at your evacuation destination;

The above key steps should be easily accessible and serve as an excellent reminder to anyone in any theatre, at any time, should the need to evacuate ever occur.

The team was appreciative of the fact that the completion of activities had been clearly communicated to the team leader. This 'closed-loop' communication, among team members, ensured that individuals who were designated to perform a certain task reported back to the team leader upon completion.

ENT team evacuate with their patient.

Surgical teams in each theatre safely evacuated and transported patients to assigned destinations. Some teams with critical patients (i.e. aorta clamped, spine open, moderate bleeding) took their patients to available theatres in the adjacent Children's OR and to the trauma OR theatre located in the emergency department. Medical Device Reprocessing (MDR) staff brought requested supplies and surgeries were continued. Stable intra-operative patients had open incisions packed/covered and were evacuated to PACU or SICU for intensive monitoring and to await an opportunity to finish the surgery in an available theatre.

Following arrival at their evacuation destinations, and after telephoning the OR control centre to give a verbal report, each surgical team, including their volunteer patients, conducted a debriefing during which team processes and inefficiencies were discussed.

The debriefing included addressing the following questions:
- Was patient transport equipment easily available?
- Did you account for all personnel when reporting back to the OR?
- Was the decision to evacuate communicated in a clear manner?
- Were you able to identify the safest route?
- Did the team maintain closed-loop communication?
- Was the team working on a common plan?
- Did the team identify necessary resources for their patient?
- Did the team effectively share resources with other teams?
- Did the team remain aware of the relevant events/factors in their environment?
- Did the team effectively delegate roles and tasks?
- Was there a clear leader?
- Did the team support the leader?
- What are suggestions for improvements?

As the PACU is the OR area of safe refuge, in the event of an evacuation, PACU personnel were major participants in the evacuation. They also utilized the event to test their

capacity and capability to respond to a code green in the OR. PACU needed to discharge patients, as possible, in order to create spaces for stable patients who would arrive from the OR and await theatre space to complete their surgical procedures. The PACU staff needed to ensure they would have enough ventilators, and other equipment, readily available. PACU personnel adapted to the sudden surplus of "incoming" and worked closely with each surgical team to safely continue care for patients.

MDR personnel also participated in the mock code green and tested their processes to ensure timely delivery of essential supplies to our surgical evacuation destinations.

Mock Evacuation Volunteers:

Volunteers were most helpful in this mock evacuation and provided objective perspectives.

Volunteer Patients:

The volunteer patients completed a questionnaire following the evacuation exercise. Questions included:
- Did the surgical team act in a calm, organized manner?
- Did you feel safe?
- Did you receive clear explanations?
- Did you understand what was happening?
- What were your concerns as a 'patient'?

Observers:

Observers were positioned in the hallways, at the OR fire control centre, and in the theatre with the fire. Each observer completed a questionnaire that included some of the following questions:

- Did personnel act in a calm, organized manner?
- Was the responsibility for decision-making clear?
- Were staff members alerted to the situation in a timely manner?
- Did personnel follow the fire evacuation plan?
- Did equipment function properly?
- What was the time lapse from when the code green was activated until the OR was completely evacuated?
- Did you identify any unexpected problems?
- Were transportation routes clear of all obstacles?
- Did any unnecessary traffic occur?
- Were adequate personnel available to transport patients?
- In the theatre with the fire:
  - o Did theatre personnel activate RACE?
    - Rescue the individuals involved in the fire
    - Activate the fire alarm
    - Confine the fire
    - Extinguish the fire and evacuate if required
  - o Did theatre personnel activate the fire alarm in a timely manner?
  - o Did the surgical team act in a cohesive manner?

- Did theatre personnel shut off the medical gas supply to the theatre?
- Were there any equipment problems and was equipment available in a timely manner?
- Was the evacuation route appropriate?

The code green simulation exercise concluded with written observation summaries from participants. A general debriefing for all participants and observers was also conducted. The information gathered from so many perspectives will be extremely valuable tools for learning from this experience, strengthening the OR evacuation plan, and improving communication and any other inefficiencies.

After the Evacuation is Complete:

After the OR is evacuated, the planning focus shifts to the patients and teams at the evacuation destination sites. These teams will be contacted by the charge nurse to assess their needs while they wait for the opportunity to complete the surgery. The charge nurse also coordinates plans regarding the provision of supplies and equipment until OR space becomes available to complete the surgery. MDR and OR support personnel may take on the important role of delivering supplies and equipment to the evacuated surgical teams.

Post-Evacuation Evaluation:

An evacuation simulation is implemented in order to assess if the OR department is prepared to effectively implement a code green. The following post-evacuation assessment questions should be considered by the planning committee:

- Is the existing OR Contingency Plan effective?
- Are the plan's communication processes, during the code, reliable and effective?
- Are all the supplies and resources, as required to carry out a safe and timely evacuation of all theatres, readily available?
- Do participants have the knowledge, skills, and resources they need to work safely and efficiently during the a code green?

Education is a Priority:

All perioperative personnel should be educated about how to implement their department's evacuation plan.[5,7] ORNAC identifies that education should occur during initial orientation and be reviewed on a regular basis and that practice drills be conducted routinely.[7]

One of the goals of this evacuation simulation exercise was to facilitate as educational opportunities for as many individuals, as possible, including to those staff who were not at work on the day of the simulation. To this end, education began two weeks prior to the simulation. Pre evacuation education involved preparing participants for the simulation. It also ensured that staff members who would not be working on the day of the evacuation were also able to learn about the process. The evacuation contingency plan was reviewed with staff, roles were discussed, fire procedures reviewed, medical gas shut-off valve sites were toured, evacuation routes identified, and the actions to take before leaving a theatre were reviewed. This ensured that all personnel were as prepared as possible to actively participate in the simulation and get the most benefit from their experiences.

All perioperative personnel should be educated about how to implement their department's evacuation plan.[5,7]

EVACUATING AN OR cont. on page 36

Table 1

PERSONNEL ROLES DURING AN OR EVACUATION

Charge Nurse:

The immediate role of the charge nurse in the event of a code green is documented on written guidelines in our OR Department Contingency. During this mock evacuation the role included:

- Ensure the nearest fire alarm pull station is activated;
- Document the time of the fire;
- Initiate a Code Red by dialling 55 and informing the emergency operator;
- If the fire is uncontrolled, activate the second stage fire alarm;
- Notify the team in the fire area of their evacuation destination;
- Determine the need to initiate a code green for complete OR evacuation;
- If required, initiate a Code green by dialling 55 and informing the emergency operator;
- Delegate someone to:
    - o Call the charge anaesthetist to come to the OR desk stat;
    - o Call Security to inform of the need to evacuate;
    - o Call PACU to clear spaces;
    - o Call pre-operative holding area to send patients back to units and to clear spaces for OR patients;
    - o Call other OR departments to determine the availability of theatres;
    - o Check if trauma OR in the Emergency Department is available; and
    - o Call MDR and inform them to stand by.

  (Note: The telephone numbers for each of the above areas are included on the written guidelines.)
- Send nurses into each theatre to inform of need to evacuate and determine status;
- Work with charge anaesthetist to plan each theatre's evacuation destination;
- Send evacuation information into each theatre with same nurses;
- Call available OR departments, PACU, and pre-operative holding area to let them know if and when surgical teams will be arriving;
- When fire safety personnel arrive at the OR, following the code red call, they may determine the need to set up an alternate command centre if the OR desk area is at risk. In this instance transfer incoming calls to the PACU control desk which will operate as the alternate command centre;
- Delegate someone to go to the visitor waiting room, which is external to the OR, to update family, etc;
- Send excess staff to the lounge (located external to the main OR). From this central point PACU and OR can access help from this pool of excess staff as required; and
- Give a copy of the destination report form to clerks operating telephones.

Charge Anaesthetist:

- Obtain a pre-evacuation theatre status report from the charge nurse;
- Immediately plan the evacuation destinations for each theatre;
- Obtain written destination reports, from personnel answering telephones at the control centre, as called in by evacuated teams; and
- Assess OR teams that have evacuated into OR theatres in other departments

Clerks at the OR Control Area:

- Follow the charge nurse's instructions; and
- Assist with accurate counts of evacuated patients and staff as per daily staffing assignment sheet, OR slate; and destination reports.

Pre-operative Holding Area Personnel:

- Send preoperative patients back to the nursing unit as directed by OR charge nurse; and
- Utilize staff resource pool from staff lounge to assist with patient transport if required; and
- Report to OR charge nurse for other assignment as appropriate.

Theatre Staff:

- Nurses:
  - o If the fire is in your theatre's service arm or other infrastructure:
    - • Remove any burning equipment from patient or use theatre's fire extinguisher to extinguish the fire if this can be done without risk of personal injury;
    - • Determine if it is necessary to evacuate immediately. If so:
    - • Activate the fire alarm;
    - • Turn off medical gas supply valves to theatre when no longer in use;
    - • Follow guidelines below; and
    - • Assign someone to place wet towels along the outside bottom of theatre doors to contain smoke after evacuation.
  - o Appoint a team captain;
  - o Gather surgical supplies as needed;
  - o Ensure the surgical incision is covered with sterile drape;
  - o Disconnect anaesthesia machine and unplug electrical equipment when no longer being used;
  - o Assist with moving the anaesthetic machine out of the theatre or assist with to gather medications and supplies;
  - o Prepare to transfer the patient onto a stretcher or unlock the OR bed and transport the bed with the patient on it (Note: If the evacuation destination is on another floor do not transport the patient on the OR bed as the wheels will jam in the elevator floor opening and ramps can be difficult to use);[6] and
  - o Following arrival at your destination, telephone the OR control desk number, and report the patient's status, equipment or supply needs, names of individuals who have left the OR with you and any other relevant information

- **Anaesthetist**
  - o Ventilate the patient using air and use IV medications to maintain anaesthesia;
  - o Turn off oxygen and nitrous oxide sources;
  - o Prepare to maintain respirations and monitoring during transport;
  - o Gather monitoring supplies including medications as needed; and
  - o Ensure anaesthetic machine is turned off and disconnected prior to leaving.

- **Surgeon**
  - o Responsible for giving the final order to move the patient; and
  - o Direct and assist movement of patient out of OR.

- **Support Staff (i.e. Perioperative Aides)**
  - o Report to assigned theatre;
  - o Assist with obtaining supplies, stretchers, etc;
  - o Assist with patient transfer;
  - o Help to clear corridors if required; and
  - o Following transfer, report to charge nurse for other assignments.

Medical Device Reprocessing Department:

- All staff immediately return to MDR;
- Staff will form teams to respond to needs of the operating rooms being evacuated to theatres external to the main OR department (in the case of our facility there were threeexternal theatres):
  - o Trauma OR
  - o Children's OR
  - o MS3 (lumps and bumps) OR
- Each team will carry a different telephone and be responsible for bringing supplies to each of the 3 OR locations.

Post Anaesthesia Care Unit (PACU):

- Discharge patients to preoperative wards where possible;
- Discharge stable patients to preoperative holding area for less intensive monitoring as appropriate;
- Utilize the OR personnel resource pool in lounge as required; and
- Ensure availability of ventilators and other equipment; and
- Report to OR charge nurse for other assignment as time permits.

Security Department:

- Immediately report to the OR ; and
- Assist as required.

Debriefing is an important component of all simulation exercises. In addition to the individual team debriefing sessions conducted by participants, immediately after evacuation, all OR personnel (including staff who were not on duty during the simulation) also participated in a general debriefing session that took place the week after the simulation.

Results:

Following the first evacuation simulation, some modifications were made to the original OR Code Green Contingency plan – mainly in relation to the communication process. A second simulation was conducted, three months later, with much smoother results. Evacuation simulations shall, in the future, occur every three years, and evacuation reviews shall occur on an annual basis. This will ensure compliance with fire code regulations and ensure that a functional efficient evacuation process remains in place.

The roles of different personnel, as outlined in the evacuation plan, were considered to be effective. A few shortages of equipment were identified during the debriefing and plans were put in place to resolve these issues. It was determined that clear signs needed to be posted to identify medical gas shut off sites for each theatre. Utilizing individual messengers (the three nurses) to disseminate information between theatres and the charge nurse was considered to have worked well.

One of the most important lessons during this process was that clear communication is critical during an evacuation. Roles need to be clearly identified and clear communication was essential both for the transfer of information to and from the theatre and when teams were reporting back from evacuation destinations. Clear concise closed-loop communication between team members, inside each theatre, and the appointment of a team leader were also considered extremely important.

All individuals involved in the evacuation simulation reported that it was an excellent learning experience. The future and regular performances of evacuation simulations will ensure all staff will eventually have the opportunity to participate and that the evacuation processes and the code green contingency plan will become familiar to all.

ORNAC Standards pertaining to this article can be found in the Operating Room Nurses Association of Canada (ORNAC) (May 2011) Standards, Guidelines, and Position Statements for Perioperative Registered Nursing Practice (10th edition). Section 4, pg(s) 260-262, standard(s) 1.4 – 1.4.9.

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